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IS 407 (1981): Brass Tubes for General Purposes [MTD 8 :  
Copper and Copper Alloys]

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IS : 407 – 1981  
(Reaffirmed 2006)

*Indian Standard*  
SPECIFICATION FOR  
BRASS TUBES FOR GENERAL PURPOSES

(Third Revision)

Fifth Reprint JULY 2007  
(Including Amendment No. 1 & 2)

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Gr 3

*August 1981*

AMENDMENT NO. 2 FEBRUARY 2005  
TO  
IS 407 : 1981 SPECIFICATION FOR  
BRASS TUBES FOR GENERAL PURPOSES  
*(Third Revision)*

(*Page 4, Table 1, Note*) — Substitute the following for the existing:

'NOTE — Other impurities do not preclude the possible presence of other unnamed elements. However, analysis shall be regularly made only for the alloying elements listed in the table. By agreement between the manufacturer and the purchaser, the limits may be established for elements not specified and analysis done.'

(MTD 8)

AMENDMENT NO. 1 JUNE 1999  
TO  
IS 407 : 1981 SPECIFICATION FOR  
BRASS TUBES FOR GENERAL PURPOSES

*(Third Revision)*

(*Page 6, Table 2, col 4*) — Substitute 'HV 5' for 'HV'.

(*Page 6, clause 10.1*) — Substitute the following for the existing clause:

"10.1 Hardness — The hardness (HV) of the material when determined in accordance with IS 1501 (Part 1) : 1984 Method for Vickers hardness test for metallic materials : Part 1 HV 5 to HV 100 (*second revision*)' shall be as given in Table 2."

(MTD 8)

# Indian Standard

## SPECIFICATION FOR

### BRASS TUBES FOR GENERAL PURPOSES

### ( Third Revision )

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*Indian Standard*  
SPECIFICATION FOR  
BRASS TUBES FOR GENERAL PURPOSES  
( *Third Revision* )

**0. F O R E W O R D**

**0.1** This Indian Standard ( Third Revision ) was adopted by the Indian Standards Institution on 12 February 1981, after the draft finalized by the Copper and Copper Alloys Sectional Committee had been approved by the Structural and Metals Division Council.

**0.2** This standard covers brass tubes of two grades of alloys used for the manufacture of hand tyre inflators and other general purposes. Grade CuZn30As is used in sugar industries. For each application, the user will have to select the alloy required and specify. In this revision, reference for dimensions has been made to IS : 5493-1981\* and the condition in which the tubes are to be supplied redefined. Modification has been made in the chemical composition and physical properties of the alloys. Doubling-over test has been deleted.

**0.3** For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS : 2-1960†. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

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**1. SCOPE**

**1.1** This standard covers the requirements of solid drawn brass tubes for general purposes. It specifies the preferred method of designating tubes by their outside diameter and lays down the permitted tolerances on outside diameter, wall thickness and length of tubes.

**2. TERMINOLOGY**

**2.0** For the purpose of this standard, the following definitions shall apply.

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\*Dimensions for wrought copper and copper alloy tubes (*first revision*).

†Rules for rounding off numerical values (*revised*).

**2.1 Mean Outside Diameter** — Half the sum of two outside diameters at right angles to each other on a right cross section of the tube.

**2.2 Mean Wall Thickness** — Half the sum of two wall thicknesses measured at the ends of a diameter of a right cross section of the tube.

**2.3 Tube** — A hollow product of uniform cross section having a continuous periphery produced by casting; drawing or extrusion process, also known as pipe.

### 3. SUPPLY OF MATERIAL

**3.1** General requirements relating to the supply of material are laid down in IS : 1387-1967\*.

### 4. MANUFACTURE

**4.1** The tubes shall be solid drawn and supplied in straight lengths. Their ends shall be clean and square with the axis of the tube. Tubes shall not be 're-drawn' from tubes that have been used previously.

### 5. CHEMICAL COMPOSITION

**5.1** The tubes shall be manufactured from alloys which, on analysis in accordance with IS : 3685-1966†, shall have the chemical composition as given in Table 1.

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TABLE 1 CHEMICAL COMPOSITION

CONSTITUENT	PERCENT	
	Grade CuZn30As	Grade CuZn37
Copper, plus incidental nickel	68.5-71.5	62.0-65.0
Lead, Max	0.07	0.30
Iron, Max	0.06	0.1
Arsenic	0.02-0.06	0.06 Max
Total impurities, Max	0.30	0.6
Zinc	Remainder	Remainder

NOTE — The chemical analysis for total impurities is not required if the supplier undertakes and certifies that the material does not contain impurities in excess of the limits specified.

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\*General requirements for the supply of metallurgical materials (*first revision*).

†Methods of chemical analysis of brasses.

## 6. FREEDOM FROM DEFECTS

**6.1** The tubes shall be reasonably round, straight, clean, smooth, uniform in diameter and free from cracks, seams, slivers, scale and other harmful defects.

## 7. CONDITION

**7.1** The tubes may be supplied in any one of the following conditions:

- a) As drawn and stress relieved — hard temper ( HD ),
- b) Temper annealed ( TA ) ( tubes which will have been heat-treated over their full length to an intermediate temper ), and
- c) Annealed ( O ).

**7.1.1** Unless otherwise specified by the purchaser, the tubes shall be supplied in the as drawn and stress relieved condition in HD temper.

## 8. SIZES AND TOLERANCES

**8.1** The tubes shall be designated by the outside diameter and the wall thickness. The outside diameter, wall thickness and length shall be as specified by the purchaser. It is recommended that the dimensions should be selected from the sizes given in IS : 5493-1981\*.

**8.2** The tolerances as given in IS : 5493 - 1981\* shall apply.

## 9. PRESSURE TESTS

**9.0** The tests specified in **9.1** or **9.2** shall be applied if required by the purchaser. These tests are intended to test the soundness of the tube wall, and are not to be regarded as an indication of strength or safe working pressure.

**9.1 Hydraulic Test** — The tubes shall show no signs of weeping, leaking or permanent increase in diameter at any point when tested as specified in Appendix A to a test pressure derived from the formula given in Appendix A, using one of the following constants as appropriate to the condition of the material.

<i>Condition</i>	<i>Constant ( K )</i>
Annealed	113
As drawn, temper annealed	155

\*Dimensions for wrought copper and copper alloy tubes (*first revision*).

**9.2 Pneumatic Test** — Tubes, when tested to an air pressure of 0.42 MPa while immersed in water, shall show no sign of leaking.

## 10. PHYSICAL TEST

**10.0 General** — The drawn tubes shall be of three tempers and designated as hard, temper annealed and annealed, depending on the physical properties as specified in Table 2.

**TABLE 2 TENSILE STRENGTH AND HARDNESS REQUIREMENTS OF TUBES**

GRADE	TEMPER	TENSILE STRENGTH MPa	HARDNESS VICKERS HV
CuZn30As	Annealed (O)	285 <i>Min</i>	75 <i>Max</i>
	Temper annealed (TA)	300 <i>Min</i>	80-110
	Hard (HD)	400 <i>Min</i>	135 <i>Min</i>
CuZn37	Annealed (O)	285 <i>Min</i>	80 <i>Max</i>
	Temper annealed (TA)	320 <i>Min</i>	80-110
	Hard (HD)	400 <i>Min</i>	130 <i>Min</i>

NOTE — 1 MPa = 0.102 kgf/mm<sup>2</sup>

**10.1 Hardness** — The hardness (HV) of the material when determined in accordance with IS : 2866-1965\* shall be as given in Table 2.

**10.2 Tensile Test** — A piece of tube, selected for test, suitably plugged or flattened sufficiently for gripping, or a strip cut from a tube, when tested in accordance with IS : 2655-1964†, shall show tensile strength as given in Table 2.

**10.3 Drifting Test** — Tubes of up to and including 100 mm nominal outside diameter shall be capable of withstanding drifting by means of a taper drift having an included angle of 45° as shown in Fig. 1, without showing either crack or flaw, until the diameter of the drifted end measures at least 30 percent more than the original diameter of the tube. Tubes representing those supplied in conditions other than annealed shall be annealed before subjecting them to this test.

\*Method for Vickers hardness test for copper and copper alloys.

†Method for tensile testing of copper and copper alloy tube.

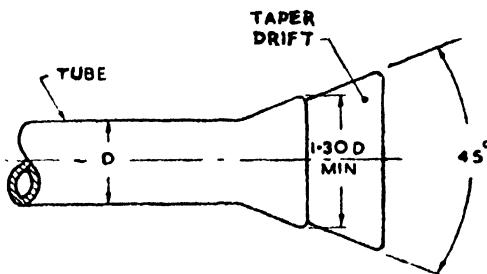


FIG. 1 DRIFT TEST

**10.4 Flattening Test ( For Tubes  $\leq 2.5$  mm Wall Thickness and not Exceeding 100 mm Outside Diameter )** — The test piece 50 mm long cut from the end of the tube shall not crack when tested in accordance with 10.4.1.1.

**10.4.1** The test pieces shall be annealed before flattening unless the tubes are supplied in the annealed condition.

**10.4.1.1** A piece of the tube shall be flattened down until the interior surface meets as shown in Fig. 2.

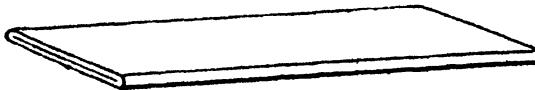


FIG. 2 FLATTENING TEST

**10.4.2 For Tubes  $> 2.5$  mm Wall Thickness and More Than 100 mm Outside Diameter** — A piece 50 mm long shall be flattened down to the extent that a micrometer or vernier calliper set at three times the wall thickness may easily pass over the flattened tube. The test piece shall be annealed before the test.

**10.5 Double Bend Test** — Test pieces shall not crack on the outside of either bend when tested as specified in 10.5.1.

**10.5.1 Double Bend Test ( For Round Tubes  $\leq 2.5$  mm Wall Thickness and Over 100 mm Outside Diameter )** — The test pieces shall be annealed before flattening unless the tubes are supplied in the annealed condition.

**10.5.1.1** Test pieces 50 mm wide, cut longitudinally from the tube, shall be flattened. The longer edges shall be carefully rounded and smoothed longitudinally so that a cross section has approximately semi-circular ends. The test pieces shall then have their ends bent through 180° in opposite direction and doubled up close as shown in Fig. 3.

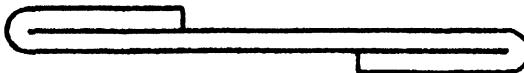


FIG. 3 DOUBLE BEND TEST

**10.6 Mercurous Nitrate Test** — The 'as drawn and stress relieved (after the final draw)' tubes shall be capable of undergoing a mercurous nitrate test, as specified in IS : 2305-1962\* without showing any sign of cracking.

## 11. MARKING

**11.1** Boxes containing tube may be suitably marked to identify the grade, temper (wherever applicable), name of the manufacturer, mass and any such information as required by the purchaser.

**11.1.1** The product may also be marked with Standard Mark.

**11.1.2** The use of the Standard Mark is governed by the provisions of the Bureau of Indian Standards Act, 1986 and the Rules and Regulations made thereunder. The details of conditions under which the licence for the use of Standard Mark may be granted to manufacturers or producers may be obtained from the Bureau of Indian Standards.

## 12. SAMPLING

**12.1** When tests are specifically called for by the purchaser, tubes (of the same type, size and temper) shall be grouped in batches of 300 tubes or 1 300 kg whichever is the greater weight and one tube shall be selected from each batch or part thereof to provide the necessary tests.

## 13. RETEST

**13.1** Should any of the test pieces first selected fail to pass any of the prescribed tests, two further samples from the same batch shall be selected for

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\*Method for mercurous nitrate test for copper and copper alloys.

testing, one of which shall be from the tube from which the original test sample was taken, unless the tube has been withdrawn by the supplier.

**13.1.1** Should the test pieces from both these additional samples pass, the batch represented by the test samples shall be deemed to comply with this standard. Should the test pieces from either of these additional samples fail, the batch represented by the test samples shall be deemed not to comply with this standard.

## A P P E N D I X A

( *Clause 9.1* )

### HYDRAULIC TEST

**A-1.** If required by the purchaser, each tube shall be hydraulically tested to an internal test pressure of the value given by the following formula. No tube shall, however, be tested to a hydraulic pressure beyond 7MPa unless otherwise agreed:

$$P = \frac{Kt}{D}$$

where

$P$  = internal test pressure in MPa,

$K$  = a constant as specified in 9.1,

$t$  = wall thickness of the tube in mm, and

$D$  = outside diameter of the tube in mm.

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